

Modular air spinning frame

The present invention relates, according to the preamble of the independent claims 1, 11 and 12, to a textile machine with several spinning places as well as different devices
5 provided thereto.

Such devices are well known in textile technology. Such a device is for example described in the DE 42 12 701 C2. This document discloses a rotor spinning frame with a multiplicity of spinning places arranged next to each other, whereby each spinning
10 place comprises a can feeding means, a spinning unit and a winding device.

A disadvantage of a device according to the afore specified patent specification is, that in case of failures in the spinning unit or on the winding up unit the entire spinning place is put out of operation.

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The disclosed application DE 36 24 904 A 1 presents a generic different type of textile machine, that is, a cross bobbin winder that, according to a modular concept, consists of pre-assembled structural units. This cross bobbin winder can be re-fitted with the utilization of several standardized and pre-assembled structural units to create different
20 types of said cross bobbin winder. According to this state of the art, each structural unit or each structural group of components possesses, for the reciprocal position-accurate interconnection, prepared fastening means, position fixing means and/or couplings for power conducting means. The modular concept is therefore known for cross bobbin winders. Cross bobbin winders perform a rewinding procedure which is substantially
25 simpler than the spinning process in a spinning place, because the winding frame operates, contrary to the spinning frames, with a coherent, continuous thread. In the generic different texturing machines for example according to the DE 36 23 370 A 1 and DE 197 05 810 A 1 it is likewise known, to provide several modules for the machine. Contrary to spinning frames, texturing machines also operate with continuous and
30 above all flexible filaments.

The present invention is therefore based on the task to arrange the spinning places in such a manner that downtimes due to failures of machine components of the spinning place or during re-fitting of the spinning place are minimized.

5 **The invention**

The task of the invention is solved by way of the characteristic features given in the independent patent claims 1, 11 and 12.

- 10 With the use of modular structured and exchangeable spinning or winding up units it is possible, during failures, and/or breakdowns of the devices mentioned, to interchange these simply and fast. With the replaceability the downtimes are substantially reduced during such occurrences. The modular structured and exchangeable spinning or winding up units have, in addition, still a further advantage: Owing to the modular
- 15 concept one can produce thread with different spinning methods on the same textile machine. A spinning frame with such a modular concept is therefore applicable in many ways. Spinning places can produce different thread at the same time on the same machine. For example thread which is produced with an air spinning method and thread which is produced with a rotor spinning method. Owing to the modular concept and the
- 20 replaceability one can refit the spinning places very fast and thus produce threads faster and more flexible according to customer requests. Such a textile machine, therefore, not only has lower downtimes, but also provides greater flexibility and lower cost of investment. The use of exchangeable winding up units, in addition has the advantage that different types of windings, and/or different types of bobbins can be produced.

25 Favourable arrangements and types of embodiments of the invention are stated in the further dependent claims.

- 30 In the following the invention and the inventive thought are explained by way of an exemplified embodiment illustrated in the figure. It is, however, to be pointed out expressly that the invention is not limited to this example.

Figure 1 shows schematically (in the cross section) a spinning place of a textile machine 1. The textile machine 1 is double-sided, whereby the figure shows only one side of the machine (the dash-dotted line shows the axis of mirror inversion of the textile machine 1). Naturally it would also be conceivable that the textile machine 1, shown in the figure, is designed only one-sided. The spinning places of the textile machine 1 comprise a can feeding means 2. The can feeding means 2 can take up one or, as is illustrated in the figure, two cans 14. For the invention it is thereby irrelevant whether one or more cans 14 are present and whether the can feeding means 2 is arranged within, next to or in front of the spinning place. It would be also conceivable that one can feeding means 2 supplies several spinning units 3, and/or several spinning places with roving. This means that the invention covers also the possibility that a can feeding means 2 supplies several spinning places (for example two) with fibre material.

Typical for a spinning place is, however, that it comprises one spinning unit 3 and one winding up unit 4. According to the invention the spinning unit 3 and the winding up unit 4 are modular structured and exchangeable (illustrated schematically in the figure). The term "modular" in the sense of the invention is to be understood in such a manner that these units form self-supporting, structural units, assembled from single components, which can be attached on, into or at the textile machine frame 15. By means of not illustrated plug-in connections the spinning units 3 and the winding up units 4 can, as far as this is necessary, be supplied with electric power and compressed air from the machine frame 15, as well as with control signals from the central machine control unit 5. The modular concept of the units 3 and 4 also allow that different spinning or winding up units can be mounted on the same textile machine frame 15. For example different spinning units 3 can be provided which, with regard to the applied spinning method, and/or thread formation method, comprise different spinning boxes 11. For example on the same textile machine frame 15 single spinning units 3 can comprise spinning boxes 11 which produce thread according to the air spinning method and other spinning units 3 can comprise spinning boxes 11 which produce thread according to a rotor spinning method. For this the textile machine frame 15 must be equipped with suitable connections for electrical power and compressed air as well as for exhaust air (not shown). Besides a central control unit 5 it is of advantage if the spinning unit 3 and the

winding up unit 4 are additionally interconnected through an exchangeable control unit 6. The exchangeable control unit 6 takes over the controlling of the individual spinning places, it especially controls and monitors the thread formation process on the spinning unit 3 and the transfer of the produced thread to the winding up unit 4. The exchangeable control unit 6 is in particular able to consider the different delivery speeds of the different spinning units 3 for the winding up unit 4. That means, it is in particular able to control the delivery speeds, and/or production speeds, of the spinning units 3 and winding up units 4. Naturally, also the central machine control unit 5 can likewise be connected with the exchangeable control units 6 of the individual spinning places. Thus control signals, for example given by the operating personnel, can be delivered, from the central machine control unit 5 through the exchangeable control units 6 of the individual spinning places, to the individual machine units (spinning or winding up units). Such control signals which are delivered through the central control unit 5, are for example the start and stop of the entire spinning frame or the draft in the refinement units (drafting units) of the spinning units.

Furthermore it is likewise provided that the spinning unit 3 or also the winding up unit 4 comprises own control means 7 and 8. These provide for the implementation of the received control signals on the actually present machine units (for example at the spinning unit 3 the controlling of the motors 12 or of the spinning box 11). The control means of the spinning unit 3 has, in particular, to control a controlled starting up and switching off of the whole spinning unit 3. For this a certain procedure can be provided.

In a preferred embodiment of the invention, the textile machine in each spinning place or for each spinning place comprises one robot, which respectively is also modular in the sense of the preceding conception, structured and exchangeable. During a machine stop the robot 9, by means of an auxiliary thread, accomplishes a start up of spinning (piecing) or, if there is a thread break, joins the thread end of the bobbin with the new thread. It is also conceivable that the robot 9 serves several spinning places (with the help of a not illustrated device for moving).

Preferably the spinning units 3 in addition comprise a refinement unit 10. The refinement unit 10 illustrated in the figure represents a drafting unit. It would, however, also be conceivable that in place of the drafting unit 10 a dissolving roller is provided. Whether a refinement unit is used and which type, depends in particular on the succeeding spinning method applied in the spinning box 11. If the thread formation method is a rotor spinning method, then preferably a dissolving roller is used as a refinement unit. The actual thread formation process in the spinning unit 3 is performed in the spinning box 11. Preferentially the modular structured and exchangeable spinning unit 3 comprises a spinning box which produces a thread according to the air spinning method. In addition the invention is, however, also suitable in that different spinning units 3 can be applied with different spinning boxes 11. Thus the spinning boxes 11 can for example produce thread according to a rotor spinning method, a friction spinning method or also according to a false twist method.

15 The spinning unit 3 can also comprise a yarn sensor 16 and a thread sensor 17. As is illustrated in the figure, the spinning unit 3 and the winding up unit 4 preferably also comprise their own drive units 12, and/or 13. The spinning units, and/or the winding up units, are thus drive-technically independent. They only receive electrical power and control signals - if necessary also compressed air - through not shown plug-in connections and lines of the textile machine frame 15, and/or from the central machine control unit 5 and/or from the control unit of the spinning place 6. The exchangeable units 3 and 4 thus comprise, for the substantial process steps, their own drive units and are not attached, by means of mechanical couplings, to a central drive unit which would be positioned on the textile machine frame 15. To the substantial process steps, which comprise their own drive units, belongs the winding at the winding up unit 4, which comprises a drive unit 13 for the friction roller 18. To the substantial process steps at the spinning unit 3 belongs the refinement in the refinement unit (in the exemplified embodiment according to the figure, a drafting unit) and the draw-off from the spinning box. The spinning unit 3, therefore, comprises two own drive units 12 for the rollers of the drafting unit and for the pair of draw-off rollers. The drives are preferably reluctance motors; however, further asynchronous motors could also be used. It is quite conceivable that for less important process steps, several units are provided with one

common drive unit. For example several winding up units 4 can comprise a common drive unit for the traversing device 19 (mechanical force transmission by means of a shaft). To the most important process steps, which comprise own drive units or motors, belong, as mentioned, the refinement in the refinement unit 10 (drive units 12) as well as in the draw-off of the spinning unit 3 or the drive 13 of the friction roller 18 in the winding up unit 4. Depending on which type of spinning box 11 is used, the spinning unit 3 can possess yet another further drive unit (not shown) for the spinning box 11 (for example for the rotor spinning method). The use of own drives for each unit - in particular for the substantial process steps - has several advantages. For example no mechanical couplings, power transmissions, or gear transmissions are required. Thus, the individual spinning places are flexible and/or individually adjustable. The speed ratios can be adapted electrically e.g. more easily (e.g. the draft in the refinement unit or the draw-off speed of the thread out of the spinning box). A synchronisation of the drive units in the spinning place can - if it should be necessary - be accomplished with the help of the control means 5 and/or 6. With the help of the own drives it is drive-technically also more simple to run different spinning places and/or spinning units on the same textile machine frame at the same time.

The invention is particularly suitable for spinning units, which produce thread with an air spinning method. With this method the thread formation takes place through air twisting. For this the spinning box comprises in each case a fibre conveying channel with a fibre guide surface for guiding the staple fibre strand, at whose outlet a turbulence chamber is provided which, for its part, comprises a spindle with a thread guiding channel. The turbulence chamber contains a fluid device, which generates a turbulence stream (air) around the inlet opening of the thread guiding channel of the spindle. The fibre strand, and/or the thread are drawn off by the thread-guiding channel. The turbulence stream around the inlet opening of the thread guiding channel causes a twisting of the outer fibres of the staple fibre strand around its internal core during the drawing off of the longitudinal fibre formation. This way a thread is being produced from a staple fibre strand. Such a method is for example disclosed in the patent document EP 854,214 (equivalent to US 5,927,0260).

The invention is not limited to the embodiment according to the figure. This embodiment is rather meant as suggestion for the specialist, in order to realize the idea of the invention in a most favourable way. Further favourable applications and combinations are therefore easily derivable which, likewise, resemble the idea of the invention and
5 which are to be protected by this application. Some of the disclosed features in this description were described combined and are claimed combined in the following claims. It is, however, also conceivable, in application of the invention thought, to claim individual features of this description on their own or in another combination. Therefore, the applicant expressly reserves the right, if necessary, to apply different combinations
10 in the application of the idea of the invention.

Reference list of numbers

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| | 1 | textile machine with several spinning places |
| | 2 | can-feeding means |
| 5 | 3 | spinning unit |
| | 2 | winding up unit |
| | 3 | central machine control unit |
| | 4 | exchangeable control unit |
| | 5 | control means of the winding up unit |
| 10 | 6 | control means of the spinning unit |
| | 7 | exchangeable and modular robot |
| | 8 | drafting unit |
| | 9 | spinning box |
| | 10 | drive of spinning unit |
| 15 | 11 | drive of winding up unit |
| | 12 | can |
| | 13 | textile machine frame |
| | 14 | yarn sensor |
| | 15 | thread sensor |
| 20 | 16 | friction roller |
| | 17 | traversing device |